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Operating under the influence: Three year recidivism rates for motivation-enhancing versus standard care programs

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ABSTRACT

Operating a motor vehicle under the influence of alcohol (OUI) is an international problem. In the United States, one intervention strategy is to require offenders to attend group-delivered interventions. We compared three year rearrest rates among 12,267 individuals in Maine receiving either a motivation-enhancing (ME) program, Prime For Life®, or historical standard care (SC) programs. We created two cohorts, one when Maine used SC (9/1/1999–8/31/2000) and one after the ME program was implemented (9/1/2002–8/31/2003). Adjusted for control variables, rearrest rates among people *not* completing an assigned program did not differ for the ME versus SC cohorts (12.1% and 11.6%, respectively; OR = 1.05, ns). In contrast, ME compared to SC program completers had lower rearrest rates (7.4% versus 9.9%, OR = 0.73, $p < .05$). The same pattern occurred for people required to take these programs plus substance use treatment (12.1% versus 14.7%, OR = 0.82, $p < .01$). For those rearrested, time to rearrest did not differ between ME and SC cohorts. Among those required to have substance abuse treatment, ME and SC arrest rates did not differ for younger individuals; otherwise, the ME cohort's lower rearrest rates occurred across gender, age, having a previous OUI, and having completed a previous intervention program.

1. Introduction

Operating motor vehicles under the influence of alcohol (OUI) is an international traffic safety problem. The Global Road Safety Partnership (2007) reports that about 20% of fatally injured drivers in high-income countries, and between 33% and 69% in low- and middle-income countries, have a blood alcohol concentration (BAC) in excess of the legal limit. While differences in legal BAC limits and surveillance systems prevent direct comparisons between countries, OUI is clearly problematic world-wide. In addition to loss of life, the economic costs themselves are high. While there are limited data for many countries, estimates suggest that alcohol-related crashes cost South Africa $14 million and Thailand $1 billion annually (in United States dollars; Global Road Safety Partnership, 2007). Moreover, an analysis by Miller and Zoloshnja (2009) estimated the 2006 cost in the United States to be $129.7 billion: $66.4 billion in economic cost and $63.3 billion in quality of life losses.

Even with implementation of a variety of deterrence and intervention strategies, a confluence of evidence suggests that the rates of OUI rearrest remain high (Nochajski and Stasiewicz, 2006). Studies conducted in the United States with time periods ranging from 2.5 to 8 years suggest that approximately 22–33% of OUI offenders recidivate (Ahlin et al., 2011; C'de Baca et al., 2001). This is problematic given the large number of OUI arrests reported by the Federal Bureau of Investigation: over 1.2 million in the United States in 2011 (Federal Bureau of Investigation, 2012). Importantly, risk for an additional OUI offense becomes considerably higher as number of prior offenses increases (Rauch et al., 2010).

1.1. Methods for reducing OUI rearrest

Identifying effective intervention methods is important given the significant consequences of OUI recidivism. Deterrence through punishment and/or incapacitation has intuitive appeal,

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but these methods have limitations. For example, while license suspension and revocation may have some effect on recidivism, upwards of 75% of offenders continue to drive without a license (Ferguson, 2013). Additionally, punishment through jail and fines has not been shown to reduce rearrest (Nochajski and Stasiewicz, 2006; Voas and Fisher, 2001). Other methods have been more promising, but their effects often dissipate upon their removal. For instance, the positive effects seen with probation, ignition interlock devices, and electronic monitoring typically do not extend beyond the period in which the sanction is in place (Elder et al., 2011; Lapham et al., 2007; Nochajski and Stasiewicz, 2006; Voas and Fisher, 2001; Rauch et al., 2011). Thus, when used alone, the long-term effectiveness of such sanctions in reducing OUI rearrest is limited (Nochajski and Stasiewicz, 2006). A key issue is that while external controls may contribute to stopping a behavior in the short term, they do not necessarily facilitate the development of the intrinsic motivation essential for sustained behavior change over longer periods of time (DiClemente, 2013). Hence, return to previous behavior once the sanction is lifted is all too common.

Because of these limitations, interventionists have developed educational and behavioral programs for use alone or in combination with deterrence approaches (Dill and Wells-Parker, 2006; Nochajski and Stasiewicz, 2006). Such programs vary broadly in scope and effectiveness (e.g., Masten and Peck, 2004; McKnight and Tippetts, 1997; Mills et al., 2008; Moore et al., 2008; Nochajski and Stasiewicz, 2006; Rider et al., 2006; Struckman-Johnson et al., 1989; Wells-Parker et al., 1995). While these interventions differ widely in their specific elements, those combining education with substance abuse treatment components have shown some success in producing cognitive changes and/or decreases in rearrest (Wells-Parker et al., 1995).

One potentially promising approach involves use of motivational interviewing (MI) techniques. In the years since MI was initially introduced (Miller and Rollnick, 1991), developers have incorporated its principles into interventions for a wide range of problem behaviors. Often referred to as motivation-enhancing (ME) interventions, these share the following characteristics: using methods explicitly geared to engaging participants, adopting a non-judgmental attitude, rolling with (rather than confronting) resistance, exploring ambivalence, facilitating participants' recognition of their own reasons for change, emphasizing participants' choice in change, and supporting participants' belief in their ability to make changes (Miller and Rollnick, 2013). One goal of these interventions is to reduce participant resistance or discord (i.e., opposition to the practitioner or the intervention). In theory, this reduction allows participants an increased openness to recognizing the consequences of their actions and exploring information relevant to their circumstances, thereby increasing motivation. Because ME approaches extend beyond simple information provision by targeting underlying attitudinal and motivational processes, they are particularly well-suited for court-mandated individuals who tend to enter intervention programs with high resistance and low motivation for change (Dill and Wells-Parker, 2006; Nochajski and Stasiewicz, 2006).

A growing body of empirical evidence supports the effectiveness of OUI prevention programs that use ME. For instance, researchers have found that brief (e.g., 30-minute) ME-based programs among OUI recidivists are associated with greater participant satisfaction and decreased drinking compared to controls (Brown et al., 2010). In terms of OUI, brief ME intervention was found to result in decreased 3-year rearrest rates in one study (Schermer et al., 2006), but in another study 5-year rearrest rates were only decreased among younger individuals (i.e., $<$43 years old) (Ouimet et al., 2013). In contrast to these relatively brief interventions, Robertson et al. (2009) examined two iterations of a more intensive (10–12 h), group-delivered, ME program for OUI offenders. They found that a version incorporating ME content and facilitator training was associated with lower 3-year rearrest rates than a previous version that did not incorporate these elements (Robertson et al., 2009). To our knowledge, the Robertson et al. (2009) study is the only one that has compared ME to non-ME group-delivered programs by examining OUI recidivism rates. Given their promising results and the fact that substance use interventions are often group-delivered in community-based practice (Weiss et al., 2004), further studies are warranted.

As the field moves towards an increased focus on "what works for whom", the OUI prevention literature benefits from understanding whether programs are more or less effective for certain types of people. For example, the effectiveness of any particular program may depend on participant characteristics such as gender, age, having previous OUI offenses, and receiving a previous OUI program. Robertson et al. (2009) did not examine such moderators of program effectiveness, and literature that addresses whether programs are differentially effective in preventing OUI recidivism for certain types of people is sparse (Brown et al., 2012; Ouimet et al., 2013). Moreover, findings from studies with related outcomes (e.g., non-OUI-specific recidivism, recidivism risk factors) have been too inconsistent to definitively say whether personal characteristics moderate program effectiveness (e.g., Brown et al., 2010, 2012; Ekeh et al., 2008; McMurran et al., 2011; Liang and Long, 2013; Ouimet et al., 2013). Hence, studies that examine the differential effectiveness of ME-based programs on OUI recidivism are needed.

1.2. The present study

The present study attempts to further the literature by replicating and extending the Robertson et al. (2009) findings. Specifically, it aims to (a) examine the effects of a prevention program using ME principles versus standard care on 3-year OUI recidivism and (b) examine potential moderating effects of participant baseline characteristics (age, gender, previous OUI offenses, and previous OUI intervention participation). To do so, the study takes advantage of a policy change in Maine (a state in the northeastern United States) where the prevention program administered to OUI offenders changed from non-ME programs to one based on ME. Comparing recidivism rates in two cohorts – one using an ME program and the other not – makes possible a quasi-experimental, real-world study contrasting these two recidivism prevention approaches.

1.3. Maine's Driver Education and Evaluation Programs (DEEP)

The Driver Education and Evaluation Programs (DEEP) are the state of Maine's programs for individuals with OUI offenses. Administered by the Maine Office of Substance Abuse and Mental Health Services, DEEP has a goal of reducing the risk of OUI rearrest. Procedures in the state include the removal of offenders' driver's licenses (or, for first offenders issuing 90-day restricted licenses) while individuals pursue services. To obtain full license reinstatement, offenders are required to contact DEEP, which assigns them to complete one of two intervention approaches; either a stand-alone prevention program or, in some circumstances, a prevention program followed by substance abuse treatment. Community-based substance abuse counselors provide the prevention programs.

Prior to 9/1/2001, DEEP used what is hereafter referred to as standard care (SC) for its prevention programs. For SC programs, DEEP personnel had the option to assign people to the Adult Assessment Program (AAP), a 2-hour, individually-provided substance use assessment. Personnel could choose this option when the individual was a first time offender with a BAC $\leq$ .14. Otherwise, personnel assigned people to the Weekend Intervention Program

(WIP), a 22-hour, group-delivered prevention program. These SC programs are described in greater detail in Section 2.3.1.

Beginning 9/1/2001, DEEP made a change and implemented an ME program (Prime For Life, PFL) for all offenders. This is a group-based program that was delivered in a 20-hour format. Described in greater detail in Section 2.3.2, it draws heavily on ME principles in delivery style. Previous evaluations have shown PFL to be associated with positive short-term outcomes in terms of behavioral intentions, attitudes, knowledge (e.g., of tolerance, what constitutes a standard drink), problem recognition, and risk perception, as well as greater program satisfaction compared to control programs (Beadnell et al., 2012; Rosengren et al., 2013). In addition to these short-term changes, evaluations have indicated that individuals assigned to and completing PFL are rearrested at lower rates than those assigned to but not completing the program (Beadnell et al., 2010). How rearrest rates for completers of this ME program compare to those from completers of other types of OUI programs has not yet been examined.

1.4. Study hypotheses

This real-world study compares 3-year OUI rearrest rates of participants in two different cohorts: those assigned to an intervention approach by DEEP while SC was in place (SC cohort) and those assigned once the ME program had been implemented (ME cohort). Our hypotheses covered three categories of people within each cohort. One category was people required to but failing to complete their assigned prevention program. The other two categories involved those who completed the intervention approach they were assigned to: one category for those completing a stand-alone prevention program, and one category for those completing the prevention program plus treatment. We hypothesized that among those who failed to complete their required prevention program, ME and SC cohort individuals would show no differences in OUI rearrest rates. In contrast, we hypothesized that the ME cohort would show lower recidivism rates and longer times to rearrest than the SC cohort in each of the other two categories; completing a stand-alone prevention program or completing the prevention program plus substance abuse treatment. We did not have explicit a priori hypotheses concerning moderation but did conduct exploratory analyses to determine whether the superior (i.e., lower) ME cohort rearrest rates differed due to gender, age, prior OUIs, and prior DEEP intervention completion.

2. Method

The Human Subjects department at the University of Maryland, Baltimore County determined that, as a secondary data analysis of existing data without identifiers, the study met the criteria for exemption.

2.1. Participants

Personnel from DEEP and other state departments in Maine provided data about OUI arrests, intervention approach assigned by DEEP, and intervention completion status. The analyses included Maine residents who were 18 years and older, nonmilitary, and with an alcohol-related OUI arrest. We selected driving records for individuals from two time periods. The SC cohort (9/1/1999–8/31/2000) represented when the prevention programs used were not based on ME principles. The ME cohort (9/1/2002–8/31/2003) represented a time when PFL was used. We selected these time frames because they balanced three considerations: keeping the cohorts close together in time, allowing for the 3-year follow up period without significant cohort overlap, and providing time for instructors in the ME cohort to become skilled with the prevention program.

We selected driving records of OUI offenders who (a) completed a required intervention approach within each cohort time frame or (b) had an OUI in the cohort time frame but failed to complete the required prevention program in the subsequent 3 years. We analyzed driving records for the 3 years subsequent to completing the assigned intervention approach (for the first group) and the 3 years following the OUI (for the second group). As mentioned, some of the completers had been assigned to an intervention approach wherein they attended a stand-alone prevention program, and others a prevention program followed by substance abuse treatment. Of the 13,385 identified as completers or noncompleters, we were able to obtain complete data on analysis variables for 12,267 (92%).

Table 1 provides descriptive information about participants. Overall, the sample tended to be young and male. Over a third had a previous OUI, and slightly less than a third had previously completed a DEEP-required intervention program in Maine. Within the noncompleter category, the ME cohort had lower representation of 30–39 year olds but was otherwise similar to the SC cohort. Among completers of the stand-alone prevention program, the ME cohort had slightly more males, 18–29 year olds, prior OUIs, and prior DEEP intervention completers. In the prevention program + treatment completers category, the cohorts had similar gender breakdowns but ME had lower numbers of 30–39 year olds, prior OUIs, and prior DEEP intervention completers. Not shown, within the category of stand-alone prevention program completers in the SC cohort, 56.5% had been assigned to AAP and 43.5% to WIP (only people assigned to this intervention approach—the stand-alone prevention program but no treatment—could be assigned to AAP). Unfortunately, we did not have access to information about education or race/ethnicity. However, in terms of race/ethnicity, it is helpful to keep in mind that the population of Maine is largely non-Hispanic White (i.e., 94.1% in 2012; United States Census Bureau, 2013).

2.2. Measures

2.2.1. OUI recidivism

We defined OUI recidivism as having a rearrest during the 3 years after intervention completion (for completers) or after the OUI arrest (for noncompleters). We chose a 3-year rearrest period so that the follow-up period would be as recommended in the literature (e.g., minimum interval of 2 years; Nochajski and Stasiewicz, 2006).

2.2.2. Cohort

We created a variable identifying whether an individual was in the SC or the ME cohort.

2.2.3. Intervention category

We categorized participants from both cohorts into one of three intervention approach categories. One was noncompleters (not having completed a prevention program). The other two were people who satisfactorily completed their requirements: either prevention program completers (assigned to and completing an SC or ME program), or prevention program + treatment completers (assigned to and completing the SC or ME program followed by substance abuse treatment). We dummy coded these categories for analyses.

2.2.4. Demographics

State records provided gender and birth date. We used the latter to determine participants' ages at the time of their qualifying event.

2.2.5. Prior OUI and prior DEEP program completion

We created two variables: whether participants had experienced a prior OUI arrest and whether they had previously

Table 1
Percentages describing participant characteristics, broken down by cohort and intervention category ($N = 12,267$).

	Total ($N = 12,267$)	Noncompleters ($n = 4309$)			Prevention program completers ($n = 3271$)			Prevention program + treatment completers ($n = 4687$)		
		Cohort[a]			Cohort[a]			Cohort[a]		
		SC ($n = 2226$)	ME ($n = 2083$)	p	SC ($n = 1856$)	ME ($n = 1415$)	p	SC ($n = 2004$)	ME ($n = 2683$)	p
Gender										
Female	20.3	18.6	18.1	.67	24.5	21.3	.03	19.1	20.7	.19
Male	79.7	81.4	81.9		75.5	78.7		80.9	79.4	
Age										
18–29	41.3	37.8	39.9	.003	46.3	53.6	<.001	36.8	38.6	<.001
30–39	27.8	31.5	26.4		25.9	20.1		33.2	27.4	
40–49	20.5	20.8	22.9		18.9	16.1		20.0	22.2	
50+	10.4	9.9	10.9		8.9	10.2		10.0	11.8	
Prior OUI										
Yes	35.2	37.3	37.0	.83	15.1	19.5	.001	49.2	43.7	<.001
No	64.8	62.7	63.0		84.9	80.5		50.8	56.3	
Prior DEEP intervention										
Yes	29.2	27.3	28.7	.32	12.7	15.8	.01	44.0	38.7	<.001
No	70.8	72.7	71.3		87.3	84.2		44.0	38.7	

State records did not contain data on education or race/ethnicity.
[a] Cohorts were created based on the type of program delivered during that time period: standard care (SC, 9/1/1999–8/31/2000, $n = 6086$) or motivation-enhancing (ME, 9/1/2002–8/31/2003, $n = 6181$).

completed a court-ordered impaired driving intervention through DEEP.

2.3. Prevention programs

2.3.1. Standard care

The two SC programs had assessment components but otherwise differed in length and content. One was the Adult Assessment Program (AAP), a 2-hour individual assessment using the Substance Abuse Life Circumstance Evaluation (SALCE). The SALCE is an assessment of people's alcohol and other drug use based on Diagnostic and Statistical Manual (DSM) and American Society of Addiction Medicine (ASAM) guidelines, as well as their overall life stress. The AAP-assigned individuals did not receive standardized feedback. Hence, the value of the AAP largely rested on any benefits derived from gains received by self-reporting behavior and life circumstances.

The other preventive SC program was the Weekend Intervention Program (WIP). Developed at Wright State University Boonshoft School of Medicine, the WIP focuses on helping participants deal with the impact of their substance-related driving conviction and the use of mood-altering substances in their lives. The WIP uses a cognitive-behavioral approach and structured presentations based on a modified health belief model (Siegal and Cole, 1993). WIP's programmatic goals are to provide a comprehensive assessment of individuals' involvement with alcohol and other drugs, gently confront participants about the consequences of their substance use and denial, encourage self-evaluation, and prepare attendees for and increase accessibility of treatment when necessary (Cole, 2012; Narayan et al., 2007). In Maine, leaders presented the program in a 22-hour group format over two weekend days.

2.3.2. ME program

PFL is an indicated prevention program that is group-delivered following a manualized protocol. The curriculum developer (Prevention Research Institute, PRI) trains program instructors to deliver concepts in a designated sequence, and use detailed syllabi and check-sheets to self-monitor adherence to the protocol. The program is based on the Lifestyle Risk Reduction Model (Thompson et al., 1984; Daugherty and Leukefeld, 2003), the Transtheoretical Model of Change (Prochaska and DiClemente, 1982), and persuasion theory (McGuire, 1974; Petty & Brinol, 2008). Content delivery is based on ME principles, and protocols and instructor training place a strong emphasis on the use of motivational rather than confrontational instructor behaviors. Specifically, PFL incorporates three elements of empirically supported practices: (a) establishing collaboration, (b) diffusing resistance, and (c) providing clear direction (Miller and Rollnick, 2002; Norcross, 2002). PFL attempts to increase perception of personal risk for negative consequences resulting from drug use and high-risk drinking. The goal is to help motivate the participant to reduce consumption and thereby avoid negative health, relationship, legal, and vocational consequences from alcohol or drug use. In Maine, the program was administered in a 20-hour group format, typically over a 3-day period (Friday through Sunday).

2.4. Substance abuse treatment

In addition to the prevention program, participants assessed as having more serious drinking problems were required to participate in substance abuse treatment to gain license reinstatement. Counselors had to be certified to provide these services, either in participating community-based agencies or in a licensed private practice. Participants received a minimum of six sessions over a 60-day period. The duration of treatment was based on clinical judgment, guided by criteria set forth in the DEEP regulations. The decision to require treatment was based on having a diagnosable substance use disorder.

2.5. Analysis strategy

We compared 3-year rearrest rates between the ME and SC cohorts. Because of the differences shown in Table 1, analyses controlled for age, gender, prior OUI, and prior DEEP intervention completion. In an initial logistic regression, predictors of OUI rearrest during the follow-up period were cohort, intervention category (i.e., noncompleter, prevention program completer, prevention program + treatment completer), and cohort × intervention category interactions. The likelihood ratio chi-square interaction effect was the key predictor of interest because it tested

the hypothesis that noncompleters did not differ in rearrests across cohorts while completers did. If this was statistically significant, we then conducted separate logistic regressions for each intervention category to test for specific differences between the ME and SC cohorts. The final step using these separate logistic regressions was to test whether age, gender, prior OUI, and prior DEEP completion moderated the effects of ME vs. SC by adding interaction terms of each by cohort. We then estimated Cox regression survival analysis with the same control and predictor variables as in the logistic regressions with months to rearrest as the outcome. Alpha level for all analyses was set at .05. To translate findings in terms of their practical significance, we calculated absolute and relative risk reduction estimates, and numbers needed to treat (NNT).

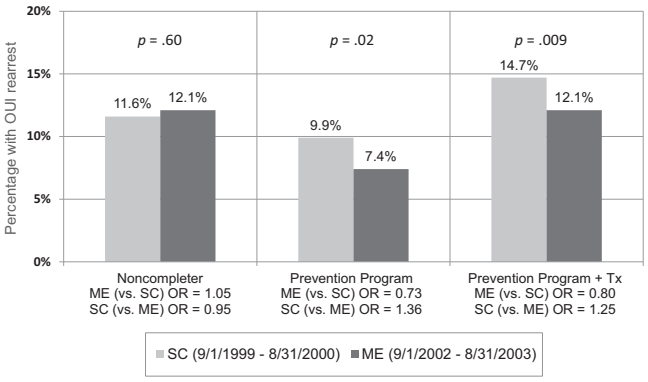

Fig. 1. Rearrest during subsequent 3 years ($N = 12,267$).

3. Results

3.1. Recidivism rates and times to rearrest

In a logistic regression predicting the occurrence of a new OUI during the 3-year follow-up, the cohort × intervention category interaction was statistically significant; *likelihood ratio* $\chi^2(2) = 6.86$, $p = .032$. Table 2 shows results from logistic regression analyses estimated separately for the noncompleter, prevention program completer, prevention program + treatment completer categories. Fig. 1 shows rearrest rates calculated from these regression estimates and adjusted for the control variables mentioned above. As hypothesized, rearrest rates for noncompleters did not significantly differ between ME and SC cohorts. In contrast, fewer program completers in the ME than the SC cohort had a subsequent OUI arrest. The ME versus SC differences occurred for the stand-alone prevention program as well as the prevention program + treatment completers. As shown in the figure, odds ratio magnitudes reflected small but present differences between cohorts (OR = 0.73 and .80 for ME versus SC; 1.36 and 1.25 for SC versus ME).

Cox regression mirrored the logistic regression findings, and Fig. 2 shows survival curves. We found a statistically significant cohort × intervention category interaction; *likelihood ratio* $\chi^2(2) = 6.75$, $p = .034$. Cox regressions estimated separately for each intervention category showed that ME versus SC hazards were not statistically significantly different for noncompleters ($p = .54$), but the ME cohort had significantly lower hazard ratios than the SC cohort for both types of completers ($p = .015$ and .012 for stand-alone prevention program and prevention program + treatment categories, respectively). As depicted in the figure, the ME completer categories had .75 and .82 lower odds of an OUI rearrest during the follow-up period than those in the SC cohort. However, in analyses restricted to only those people who had a rearrest during the 3-year follow-up (not shown in the figure), median number of months to arrest did not differ for the ME vs. SC stand-alone prevention program category; *median* = 16 and 15, $\chi^2(1) = 0.68$, $p = .41$. The same was true for the prevention program + treatment category; *median* = 17 and 15, $\chi^2(1) = 1.04$, $p = 31$.

3.2. Moderation effects

In a second step in the logistic regressions, we assessed whether gender, age, previous OUI, or previous DEEP program completion moderated the effects of ME versus SC. We added four moderator × intervention category interaction terms to the Table 2 prevention program and prevention program + treatment regressions. For the stand-alone prevention program category, we found no significant interactions involving gender, age, previous OUI, or previous DEEP intervention completion; *likelihood ratios* $\chi^2(1) = 0.17$, $\chi^2(3) = 2.98$, $\chi^2(1) = 0.03$, and $\chi^2(1) = 0.06$, respectively, all ns. For the prevention program + treatment category, we found no significant interactions for gender, previous OUI, or previous DEEP program completion; *likelihood ratios* $\chi^2(1) = 0.76$, $\chi^2(1) = 0.02$, and $\chi^2(1) = 1.92$, respectively, all ns. However, we did find a significant

Table 2
Logistic regression results for each intervention category showing the effects of ME versus SC cohorts on 3-year rearrest rates ($N = 12,267$).

Predictor	Intervention category					
	Noncompleters ($n = 4309$)		Prevention program completers ($n = 3271$)		Prevention program + treatment completers ($n = 4687$)	
	Coefficient (S.E.)	Odds ratio (95% CI)	Coefficient (S.E.)	Odds ratio (95% CI)	Coefficient (S.E.)	Odds ratio (95% CI)
Intercept	−2.04 (0.10)	–	−1.91 (0.10)	–	−1.78 (0.09)	–
ME cohort (reference is SC)[a]	0.05 (0.09)	1.05 (0.87–1.26)	−0.31* (0.13)	0.73 (0.57–0.94)	−0.23** (0.09)	0.80 (0.67–0.94)
Female (reference is male)	−0.35** (0.14)	0.70 (0.54–0.92)	−0.26 (0.16)	0.77 (0.57–1.05)	−0.23* (0.12)	0.79 (0.63–0.99)
Age (reference is 18–19)						
30–39	−0.05 (0.12)	0.95 (0.76–1.19)	−0.53** (0.16)	0.59 (0.43–0.81)	−0.06 (0.10)	0.94 (0.77–1.15)
40–49	−0.15 (0.13)	0.86 (0.67–1.10)	−0.45* (0.18)	0.64 (0.45–0.91)	−0.32** (0.12)	0.73 (0.57–0.92)
50+	−0.55** (0.19)	0.58 (0.40–0.83)	−0.75** (0.26)	0.47 (0.29–0.78)	−0.49** (0.16)	0.61 (0.45–0.85)
Had prior OUI	0.53*** (0.15)	1.71 (1.27–2.29)	0.75** (0.28)	2.11 (1.21–3.69)	0.80*** (0.17)	2.23 (1.60–3.11)
Had prior DEEP intervention	−0.06 (0.16)	0.94 (0.69–1.29)	−0.66* (0.32)	0.51 (0.27–0.97)	−0.40* (0.17)	0.67 (0.48–0.94)

Note: Odds ratios >1.0 indicate greater and <1.00 lower odds of having a rearrest.

[a] Cohorts were created based on the type of program delivered during that time period: standard care (SC, 9/1/1999–8/31/2000, $n = 6086$) or motivation-enhancing (ME, 9/1/2002–8/31/2003, $n = 6181$).

* $p < .05$.

** $p < .01$.

*** $p < .001$.

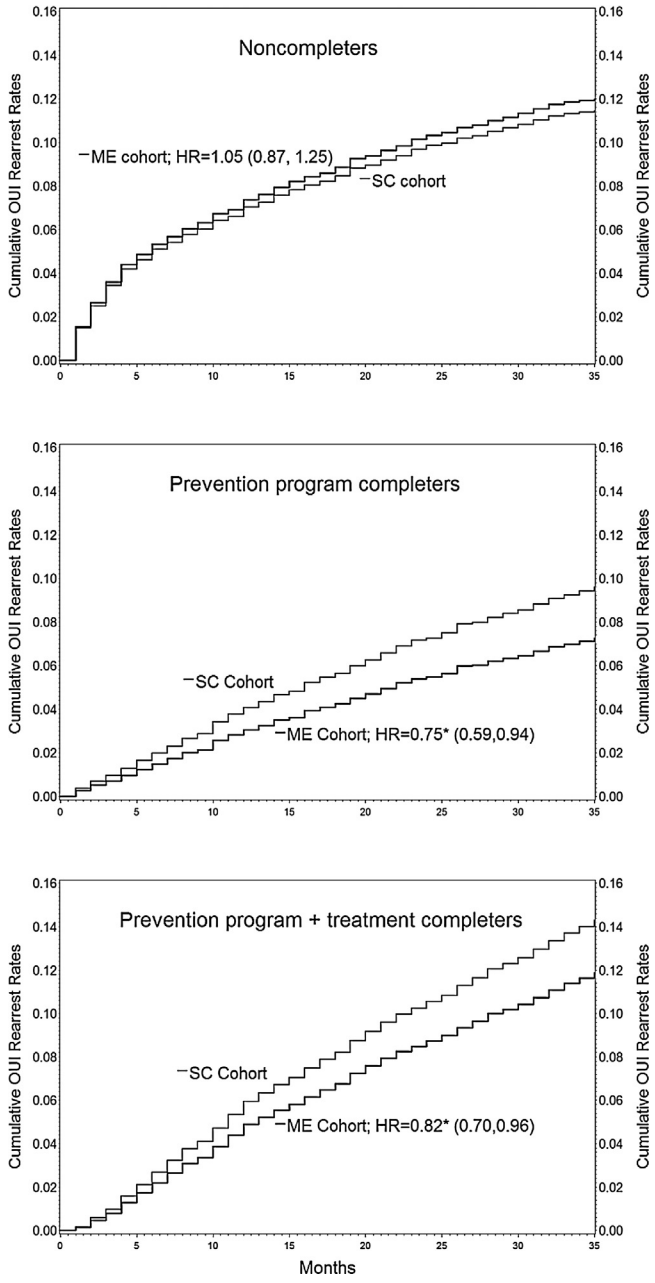

Fig. 2. Survival curves showing cumulating OUI arrests over 36 months (*$p < .05$).

interaction involving age; *likelihood ratio* $\chi^2(3) = 15.28$, $p = .002$. Fig. 3 shows predicted rearrest rates based on this regression, with probability values for ME versus SC comparisons for each age group. As can be seen, among the prevention program + treatment category, ME had significantly lower rearrest rates than SC for the 40–49 and 50+ but not the 18–29 and 30–39 age groups.

3.3. Practical significance

Differences in rearrest rates (absolute risk reduction) and odds ratios between ME and SC cohorts were fairly small. However, relative risk reduction was notable, as these numbers translate into 25.2% and 17.7% fewer rearrests for these two categories. Using number needed to treat (NNT) analyses, the ME program would need to treat 40 participants to avoid a rearrest that would have occurred in the SC program; the prevention program + treatment number for ME was 39 participants.

4. Discussion

We analyzed state record data from one state within the United States to evaluate the impact of two types of prevention programs on alcohol-related OUI rearrest, one representing a more traditional standard of care and the other a theory-based ME program. The state used both types of prevention programs either alone or, for some people, in conjunction with substance abuse treatment. We designed the analyses to address some of the challenges inherent in analyzing official records. First, we included the main effect of cohort as a predictor in all analyses to control for possible differences in overall arrest rates due to changing levels of law enforcement or other historical factors (Nochajski and Stasiewicz, 2006). Second, we controlled for potentially confounding factors for which we had data (age, gender, previous OUI, and previous intervention). The use of official records had the advantage of not being subject to self-report biases but the disadvantage of not including all variables of potential interest (e.g., education and race/ethnicity).

These results support the relative superiority of interventions using ME content and facilitation. We found support for the hypotheses that subsequent OUI rates would remain consistent across the two time frames for noncompleters (people not completing a required program), and that Maine's use of an ME program would lead to lower rearrest rates among intervention completers compared to the SC programs. In contrast, we did not find support for the hypothesis about time to rearrest: among those who were rearrested, we found no between-cohort differences in time it took for that to happen.

In this study, ME appeared to have superiority for a range of types of people. Specifically, the ME cohort's lower rearrest rates occurred regardless of gender, prior OUI, and prior intervention completion. This was also true for age in the stand-alone prevention program category wherein younger and older people all had lower rearrest rates for the ME cohort. In this regard, our findings are different than other research suggesting that ME techniques lack effectiveness in OUI prevention with young adults (Foxcroft et al., 2014). On the other hand, age did moderate the cohort effect for the prevention program + treatment category. Although the ME cohort had lower overall rearrest rates, closer examination showed that this was only the case for the older age groups (40 and above). In contrast, rearrest rates for 18–29 year olds were not lower for the ME cohort, and although they were numerically lower for 30–39 year old participants, this was statistically nonsignificant.

While supporting the use of ME methods across age groups for individuals assigned to complete a prevention program only, these findings raise questions about whether and how ME programs can add value to standard care for younger people who were assigned to the prevention program + treatment intervention. These individuals would typically be those with signs of more severe substance abuse considering assignment to this intervention category was often related to having previous OUIs, higher BACs, and/or other indicators of serious use. Future research questions include whether there is greater effectiveness with young people when the substance abuse program itself also uses versus does not use ME methods, and whether larger doses of ME in prevention programs might be useful to prepare young people for treatment.

4.1. Practical meaning

Given that ME interventions have been steadily gaining popularity, with growing numbers of practitioners receiving training in this approach, an important question concerns the practical significance of this study's findings. One way to evaluate practical importance is in terms of the magnitude of the reduction in rearrests. Even with the low overall rearrest rates in this sample,

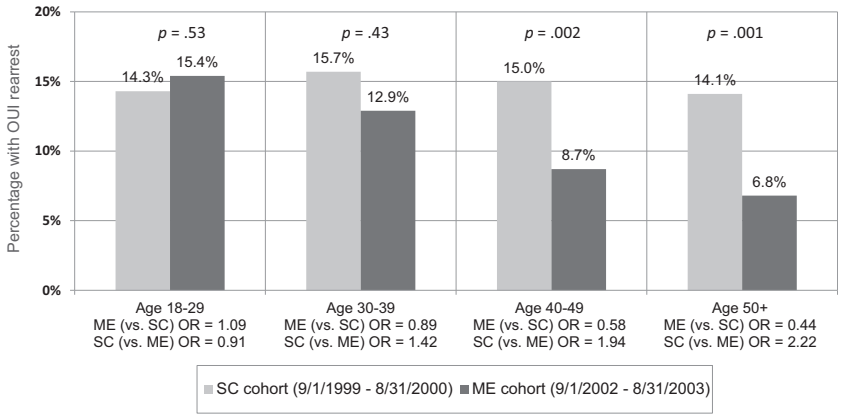

Fig. 3. Rearrest during subsequent 3 years for each age group among the prevention program + treatment completers ($N = 4309$).

we still found notable relative risk reductions of 25.2% and 17.7%, which are translatable into numbers needed to treat (NNT) of 40 and 39. This means providing the ME program to 40 people (or 39 for those receiving it plus treatment) would avert one additional arrest that would have occurred with SC. While we are not aware of impaired driving intervention studies that have estimated NNT, our figures compare favorably to NNTs from other substance abuse preventive interventions that have been compared to an SC condition. Interventions with statistically significant effects have NNTs ranging from 13.6 to 98, depending on the outcome (e.g., Faggiano et al., 2008; Koning et al., 2009).

To further illustrate their practical importance, we translated the relative risk reduction figures into the actual number of preventable rearrests when using an ME versus SC program. Based on the breakdown in the present sample, we assumed hypothetically for these calculations that 25% of offenders are assigned to and complete a prevention program and 45% a prevention program + treatment. We calculated preventable rearrests for small and large states within the United States and, to do so, chose as examples the numbers of OUI arrests in 2012 in Maine (5834) and California (172,345) (Foundation for Advancing Alcohol Responsibility, 2014). In the smaller state, 832 rearrests could be prevented over the subsequent 3 years (367 and 465 for a stand-alone prevention program and a prevention program + treatment, respectively) and in the larger state, as many as 24,585 (10,858 and 13,727).

These numbers can be translated to financial terms, specifically, savings over a 3-year period following intervention provision within any particular year. We chose $15,000 as a conservative estimate of costs to the OUI offenders themselves (e.g., legal fees, intervention fees, and higher insurance premiums) and $5000 as costs to the justice system.[1] Multiplying these by the number of preventable arrests calculated for each state above, one year of ME versus SC would (over the subsequent 3 years) save OUI offenders from 12.48 to 368.78 million dollars (depending on the size of the state), and justice systems from 4.16 to 122.93 million dollars. It is important to note that, while informative, these estimates do not include all possible financial costs (e.g., those to victims, emergency services, and law enforcement if an accident or injury occurs), nor do they include the important but difficult to quantify cost of resultant human suffering.

4.2. Implications for international practice

Given that OUI is a world-wide problem, there are important questions as to whether service providers in other cultures and countries would find ME interventions to be acceptable and be able/willing to learn them, and whether recipients would benefit. A growing literature suggests that motivational interviewing (MI), the conceptual basis of ME interventions, does indeed appeal to counselors internationally. The Motivational Interviewing Network of Trainers (MINT, www.motivationalinterviewing.org) reports membership representing 35 countries and more than 20 languages. Additionally, training appears to be effective across cultures. For instance, Miller et al. (2008) found that counselors from racial/ethnic minority cultures within the United States gained MI skills at least as well as those from the majority culture. Likewise, a recent literature review (Söderlund et al., 2011) including studies from Canada, Denmark, Ireland, the Netherlands, Sweden, the United States, and Wales concluded that counselor training generated positive outcomes such as competence in and clinical use of MI.

With regard to recipient perceptions of acceptability and benefit, preliminary research suggests that ME techniques are acceptable and effective in minority groups and in various countries. In the United States, such techniques have shown acceptability among Native American youth (Gilder et al., 2011), and a meta-analysis (Hettema et al., 2005) showed MI effect sizes of larger magnitude in ethnic minority populations. Research on MI's effects is expanding across countries and types of targeted behaviors. For example, researchers report changes in recurrent stroke in New Zealand (Krishnamurthi et al., 2014); saturated fat intake in the Netherlands (Brug et al., 2007); implementation of safe water techniques in Zambia (Quick, 2003); amphetamine consumption amongst dependent users in Thailand (Suvanchot et al., 2012); and smoking in Canada (Cossette et al., 2012), Spain (Soria et al., 2006), and Germany (Thyrian et al., 2007). While this growing body of evidence suggests that ME techniques are transportable across cultures, future research is needed to determine whether this is true specifically for the OUI population.

4.3. Limitations

A limitation of this comparison concerns the stand-alone prevention program category. Programmatic differences existed

[1] Estimates for OUI offender costs vary depending on one's jurisdiction and previous arrest history, and range from $9000 to $24,000 in the United States (Guillot, 2010). While estimates of the financial cost of arrests to the justice system are typically reported in aggregate at the state or federal level, costs for dealing with a single OUI through the traditional judicial process (i.e., police, jail, supervision) have been estimated at $4312 (Roman et al., 2009) and $5438 (Mackin et al., 2009; Roman et al., 2009). Due to differences in currency and the extent to which costs of OUI are born by the government versus individuals, cost savings will vary across countries.

such that SC cohort individuals were assigned to one of two programs, a relatively brief one (AAP) or one (WIP) similar in length to the later ME program. In contrast, all ME cohort assignments were to a single program (PFL). Unfortunately, there is no clear-cut way to distinguish which individuals in the ME cohort would have been assigned to the shorter program or the longer program had they been part of the SC cohort. As a result, it is impossible to infer whether the cohort effect favoring ME for the stand-alone prevention program category is due to differences in length compared to AAP, differences in content compared to WIP, or both. However, even a conservative interpretation (i.e., that the ME cohort's outperformance was driven because of longer program length compared to AAP) favors use of the ME program. The reason is because the shorter AAP program involved a one-on-one meeting while the ME program was group-delivered. From a cost- and time-efficiency perspective alone, the group-based, 20-hour PFL program would be superior to the 2-hour AAP. For example, with 15 individuals, one PFL group would involve 20 h of staff time versus the 30 h AAP would require.

These results should be interpreted with several other limitations in mind. Analyses suggesting benefits of ME versus the SC programs were of people who completed them. A segment of court-ordered individuals do not follow through with their mandate (Crew & Johnson, 2011; Moore et al., 2008; Robertson et al., 2009; Wells-Parker and Williams, 2002), and we cannot know how these programs would have performed with such people. Another limitation is that the lack of complete records on drinking-related accidents and injuries prevented us from examining them as outcomes. Finally, we cannot generalize the findings to people arrested for alcohol-related offenses other than OUI, people arrested for drug-impaired driving or other drug-related offenses, nor (as mentioned) to people outside the United States.

4.4. Conclusions and future research

The findings suggest effectiveness for ME interventions. This includes their use both as a sole intervention and a collaborative component when combined with substance abuse treatment. Future research can strengthen these findings by examining such interventions in other countries, having even larger samples sizes (especially representing each age group), and using comparison conditions that are equivalent in attention and time. While difficult given the real-world delivery of such interventions, use of random assignment to conditions is always a preferred approach.

Future research should continue to examine the question of whether personal characteristics moderate intervention effectiveness. Such information could benefit interventionists and lawmakers by identifying subpopulations that benefit less from particular programs. In such cases, identifying these may yield clues to how programs may be improved and who may be better served by different approaches. In addition to the variables we examined, possible characteristics of interest are those known to be associated with OUI rearrest or to moderate the effects of OUI intervention. These include employment status, income, use of drugs other than alcohol, frequency of prior OUI behavior, family history of substance use problems, level of psychopathology, substance use severity and level of use, willingness to change drinking behavior, race/ethnicity, and education (Brown et al., 2012; Field et al., 2010; Freeman et al., 2007; Nochajski & Stasiewicz, 2006; Wells-Parker et al., 1989). As previously stated, an additional and interesting question concerns those who are court-ordered to but do not complete an intervention. Research is needed to better explain what steps might be taken to optimize follow-through.

Finally, it is important to note there is an increasing focus in many countries on drug-impaired driving. While prevalence estimates vary according to time of day, drugs tested for, and country (e.g., Compton and Berning, 2009; Davey et al., 2009; Simonsen et al., 2012), studies looking at fatally and non-fatally injured individuals show the presence of licit and illicit drugs at rates ranging from 2.7% to 41.3% (Davey et al., 2014; National Highway Traffic Safety Administration, 2010). The time has come for research on intervention effectiveness to expand beyond a focus on drinking arrests and include those involving other drug use.

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